

S.Maa - Application No. - 08/833,342

## CLAIMS

What is claimed is:

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35 1. In combination with a multimedia computer, an animated talking toy including a body portion having at least one movable portion and a loudspeaker situated within said body for reproducing selected audio sound in response to receiving an external sound signal transmitted from the multimedia computer, the improvement therein including actuation means situated within said body and operable by an external digital animation-control signal transmitted from the multimedia computer, said actuation means including:

an actuator for moving said movable portion; and

actuation-control means for controlling the actuator;

said actuator having only two phases for moving said movable portion in response to said actuation-control means receiving said external digital animation-control signal.

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36 2. The improvement of claim 1, wherein said actuator comprises a solenoid means having a wiring coil and a magnetic plunger member disposed therein and attached to said movable portion, and wherein said actuation-control means includes means for selectively switching electric current to said wiring coil in response to receiving said external digital animation-control signal so as to move the plunger member and hence the movable portion.

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3. An animated talking toy figure responsive to receiving an external digital animation-control signal sequence and an external sound signal sequence representing a selected audio sound, said toy figure including:

a body having at least one movable portion;

an audio output means situated within said body for reproducing the selected audio sound in response to the toy receiving the sound signal sequence; and

actuation means situated within said body and operable by the external digital animation-control signal sequence for actuating said movable portion.

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4. The animated talking toy figure as set forth in claim 3, wherein said actuation means includes actuation-control means operable by said external digital animation-control signal sequence and an actuator having only two phases for moving said movable portion in response to said actuation-control means receiving the external digital animation-control signal sequence.

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3 39 5. The animated talking toy figure as set forth in claim 4, wherein said actuator comprises a solenoid means having a wiring coil and a magnetic plunger member disposed therein and attached to said movable portion of the toy, and wherein said actuation-control means includes means for  
5 selectively switching electric current to said wiring coil in response to the actuation-control means receiving said external digital animation-control signal sequence so as to actuate said plunger member and hence said movable portion.

10 39 6. The animated talking toy figure as set forth in claim 5, wherein said actuator further includes means for coupling said movable portion of the toy to said plunger member of the solenoid.

24 7. The animated talking toy figure as set forth in claim 6, wherein said means for coupling includes, means for attaching said movable portion of the toy to said plunger member of the solenoid so as to apply torque to pivotally move the movable portion by the plunger member, and a return spring means attached to the movable portion for applying a biasing force to the movable portion in an  
15 opposite direction to the force applied by the plunger member.

42 8. The animated talking toy figure as set forth in claim 7, wherein said actuation-control means further includes, means for transferring said external digital animation-control signal sequence received to a drive-control signal sequence comprising a sequence of a first and a second drive-control signals for representing a first and a second predefined binary values respectively, and control input means for receiving said drive-control signal sequence, and wherein said means for switching electric current connects electric current of appropriate intensity to said wiring coil of the solenoid in response to said control input means receiving the first drive-control signal so as to move said plunger member and  
25 hence said movable portion attached thereto and disconnects electric current from the wiring coil in response to the control input means receiving the second drive-control signal so as to return the movable portion to its default position.

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9 ~~43-9~~ 9. The animated talking toy figure as set forth in claim ~~3~~<sup>3T3</sup>, wherein said body further includes a second movable portion, wherein said external digital animation-control signal sequence includes a second digital control signal sequence, and wherein said actuation means includes a first and a second actuators for causing independent movements of said two movable portions of the toy respectively in response to the actuation means receiving the respective first and the second external digital control signal sequences.

10. In combination with a multimedia computer, an animated talking toy responsive to receiving a sequence of sound signals representing a selected audio speech and a sequence of digital animation-control signals transmitted from the computer, said animated talking toy comprising:

a toy figure having a body portion including at least one movable portion;

an audio output means situated within said body for reproducing the selected audio speech in response to the toy receiving said sound signal sequence; and

actuation means situated within said body, including an actuation-control means operable by said digital animation-control signals and an actuator for moving said movable portion in response to the actuation-control means receiving the digital animation-control signals;

said digital animation-control signal sequence being associated with said selected audio speech in a predetermined manner and transmitted to the toy in synchronization with the transmission of said sound signal sequence to the toy.

11. The animated talking toy as defined in Claim ~~10~~<sup>10</sup>, wherein said at least one movable portion includes a mouth, and wherein said digital animation-control signal sequence represents movement of the mouth in synchronization with transmission of said sound signal sequence to simulate speaking.

12. The animated talking toy as defined in Claim ~~10~~<sup>10</sup>, wherein said toy further includes a second movable portion, wherein said digital animation-control signal sequence includes a second digital control signal sequence, and wherein said actuation means further includes a second actuators for causing movement of said second movable portion in response to the actuation means receiving the second digital control signal sequence, said movement of the second movable portion being independent of that of the first movable portion.

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13. The animated talking toy as defined in Claim ~~10~~<sup>44</sup>, wherein said actuator comprises a solenoid means having a wiring coil and a magnetic plunger member disposed therein and attached to said movable portion, and wherein said actuation-control means includes a control input means for receiving said digital animation-control signals and means for selectively switching electric current to said wiring coil of the solenoid for movement of the plunger member and the movable portion in response to the control input means receiving the animation-control signals.

14. The animated talking toy as defined in Claim ~~10~~<sup>44</sup>, wherein said digital animation-control signal sequence comprises a sequence of a first and a second logic signals indicating a first and a second positions of said movable portion and representing a first and a second predefined binary digital values respectively, and wherein said predetermined manner comprises association of each letter, typographic symbol, and null space in the text of said audio speech with one of said binary digital values according to arrangement of vowel letters in said text and according to the speed and total time of each continuous portion of said audio speech.

15. The animated talking toy as defined in Claim ~~14~~<sup>44</sup>, wherein said predetermined manner further comprises association of the timing period of each said logic signal of said animation-control signal sequence with average timing unit of the corresponding continuous portion of said preselected audio speech, said average timing unit being equal to the total time of said continuous portion divided by total number of letters, typographic symbols, and null spaces in the text of said continuous portion.

16. The animated talking toy of Claim ~~10~~<sup>44</sup> further including a microphone means situated within said body for converting an external audio sound received by the toy to an electrical signal for transmission to the computer.

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17 ~~17~~ In combination, an animated talking toy operable by an external binary digital animation-control signal for controlling the animation thereof and by an external sound signal for providing and controlling the sound thereof, a multimedia computing means for generating a sound signal sequence, representing a preselected audio speech, and a sequence of binary digital animation-control signals for transmission to said toy, and means for transmitting said sound signal sequence and said digital animation-control signal sequence from said multimedia computing means to said toy,

said toy comprising,

a toy figure with an appearance simulating that of a living being, including a body and a movable mouth,

an audio output means situated within said body for reproducing the preselected audio speech in response to the toy receiving the sound signal sequence, and

actuation means situated within said body and feasible for digital control, including an actuation-control means operable by said binary digital animation-control signals and an actuator for moving the movable mouth in response to the actuation-control means receiving the animation-control signals,

said multimedia computing means including,

means for generating the sound signal sequence for transmission to said audio output means over said means for transmitting,

means for generating, based on textual content and speed of said selected audio speech, the animation-control signal sequence for transmission to said actuation means over said means for transmitting, and

means for causing synchronous transmission of said animation-control signal sequence to said actuation means and said sound signal sequence to said audio output means.

18 ~~18~~ The combination of Claim 17, wherein said animation-control signal sequence comprises a sequence of a first and a second binary logic signals, wherein said actuation-control means includes means for selectively switching electric current to said actuator in response to receiving said binary logic signals, and wherein said actuator has only two phases for moving said movable mouth in a first direction in response to said actuation-control means receiving the first binary logic signal and in the other direction in response to said actuation-control means receiving the second binary logic signal.

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19. The combination of Claim ~~17~~<sup>54 17</sup>, wherein said animation-control signal sequence comprises a sequence of a first and a second binary logic signals representing a first and a second predefined binary codes respectively, wherein said means for generating animation-control signal sequence includes means for sequencing said binary logic signals by assigning one of said binary codes to each letter in said textual content, according to the speed of said preselected audio speech, the reaction time of said actuator, and the arrangement of vowel letters in said textual content, for defining logic level of each said binary logic signal and for indicating positions of said movable mouth, and by constructing the timing period for each said logic signal of the animation-control signal sequence according to the speed of said preselected audio speech.

20. The combination of Claim ~~17~~<sup>54 17</sup>, wherein said multimedia computing means further includes means for storing text data representing the selected audio speech for being processed by the computing means, and wherein said means for generating sound signal sequence includes speech synthesizing means for synthesizing, based on said text data, the sound signal sequence.

21. The combination of Claim ~~20~~<sup>54 20</sup>, wherein said multimedia computing means further includes means for storing a lookup dictionary comprising digital sound data representing a plurality of predefined spoken words in combination with predetermined synchronization-control codes, wherein said means for generating digital animation-control signal sequence includes means for selecting and sequencing, based on said text data, said synchronization-control codes in the lookup dictionary for constructing the digital animation-control signal sequence, and wherein said means for generating sound signal sequence includes means for selecting and sequencing, based on the text data, said digital sound data in the lookup dictionary for constructing the sound signal sequence.

22. The combination of Claim ~~17~~<sup>54 17</sup>, wherein said toy figure further includes a microphone means situated within said body for converting an external audio sound received by the toy to an electrical signal for transmission to said multimedia computing means over said means for transmitting, and wherein said multimedia computing means further includes means for recording said external audio sound received by the toy and means for recognizing textual content of said external audio sound.

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23. The combination of Claim ~~22~~<sup>22</sup>, wherein said means for generating sound signal sequence further includes means for playing back said external audio sound in real time, and wherein said means for causing synchronous transmission includes means for synchronizing said playing back of the external audio sound with transmission of said animation-control signal sequence from said computing means to said toy.

24. The combination of Claim ~~17~~<sup>17</sup>, wherein said multimedia computing means further includes a monitor and means for displaying image animation on said monitor in coordination with said movable mouth.

25. The combination of claim ~~17~~<sup>17</sup>, wherein said means for transmitting comprises an elongated cable extending from said toy to said multimedia computing means.

26. The combination of claim ~~17~~<sup>17</sup>, wherein said animated talking toy further includes,

a second body having a movable mouth,

a second audio output means situated within said second body for reproducing a second selected audio speech in response to receiving a second sound signal sequence transmitted from the computing means, and

a second actuation means situated within said second body for moving the movable mouth thereof,

and wherein said multimedia computing means includes,

means for generating the second sound signal sequence representing the second selected audio speech for transmission to said second audio output means over said means for transmitting,

means for generating, based on textual content and speed of said second selected audio speech, a second binary digital animation-control signal sequence for transmission to said second actuation means over said means for transmitting,

means for causing synchronous transmission of said second digital animation-control signal sequence to said second actuation means and said second sound signal sequence to said second audio output means, and

means for coordinating the sound and animation of the second toy body with that of the first toy body.